ECONOMY OF HEAT IN COOKING.

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IT is well known that the potential energy of fuel, when applied to steam-engines, is largely dissipated without mechanical or other useful effect. It is none the less true when applied to cooking that heat goes out into the flues or produces uncomfortable temperatures in our kitchens, while but a small percentage of it is actually employed in those preparations of food we term cooking.

In most of these operations the essential thing is the maintenance of requisite temperature long enough to secure those chemical changes and that breaking up of starchy or proteid constituents which renders the food palatable and easy to digest. In the great majority of culinary processes there is no necessity for evaporation with the consequent loss of heat, nor for the access of air. As ordinarily conducted there is often a great amount of vapor set free, mixed with other gases with unpleasant odors. Then there is the discomfort of having this vapor condense on windows and furniture and contaminate the air we must breathe. To avoid this waste of heat and its unpleasant results, we have only to raise our cooking vessels and their contents to the proper temperature and then put them into an enclosure where the heat cannot escape. It is the continuance of heat and not its constant addition which effects the cooking.

Our problem is to prevent the escape of heat; and while the solution is not absolute, we can secure practical results without much difficulty. Of the modes of heat transference, radiation, convection and conduction, we shall need to consider chiefly the latter in making an enclosure impervious to heat. Metals, well known as the best conductors, will therefore be discarded from our list of available materials. Of other solids, various kinds of wood, stone and manufactured products remain to be chosen from, and their merit is chiefly determined by the amount of air-spaces they include. The poorest conductors are liquids and gases, but the former are obviously not available, and we are therefore led to choose a substance filled with air-spaces so small that convection need not be considered, and have practically a gaseous enclosure for retaining heat.

We may take wood where the air-cells are formed in the natural growth of plants, or we may take asbestos or many other silicates

of earthy elements, which are either formed among the rocks as long fibrous filaments, or may be manufactured by processes analogous to that employed in making gas-mantles. We may employ sawdust, cork cuttings, also the fibers of plants, as cotton, hemp, etc., or may use animal products, as wool, fur, felt, and feathers; but in all these the efficacy will be determined by their porous qualities, *i. e.*, by the included air-spaces. An enclosure that has much to recommend it both as a non-conductor and as an antiseptic is charcoal. The makers of refrigerators have found this out, and often surround the ice-chest with a stratum of charcoal.

When cooking is confined to substances that require only the boiling temperature of water, the plan of the ordinary fireless cooker is sufficient, and will secure most satisfactory results; but if it is desired to give a scorching temperature, as in the baking of bread and pies or in the roasting of meats, it will be necessary to raise the cooking inclosure to the required degree of heat either by hot bricks, slabs of steatite or by a gas jet. An electric heater would perhaps be the best means of any to get the oven hot, and then the source of heat may be turned off, and the oven closed and left to finish the cooking process more evenly and with less danger of burning than in the old way. The fuel saved here is the whole amount needed to run the furnace during the period of baking. The old brick oven was like this in principle, but it took a large amount of fuel to heat such a mass of brickwork, for there was no device to prevent radiation and waste of heat, and therefore a great supply must be stored up.

There is a field for inventive genius in the construction of a stove which shall be surrounded by non-conducting material, so that when any desired temperature is reached the fire may be turned off and the viands receive requisite cooking without further application of heat. The non-conducting envelope for such an oven, when it is to be adapted to all kinds of cooking, must be of some non-combustible material which has the essential closed air-spaces, and the mineral asbestos will at once be suggested as both cheap and effective. When the boiling temperature is high enough, as is the case with most kinds of food, then the restriction of our envelope to non-combustibles is not necessary, and we have the simple requirements of the ordinary fireless cooker. Starting with the boiling temperature, such an oven, properly made, will not lose more than twenty-five degrees in five hours, leaving it amply hot to cook cereals. When evaporation is necessary, then, of course, this economy of heat is not possible, for evaporatian implies a con-

stant escape of heat. It is fortunate that the majority of viands do not require the evaporating process.

It should be remembered that fireless cookers must be kept clean. Vapors are given off and will condense more or less on the walls, packing and lining, and these ought to be removable and adapted to ready cleansing. This renovation need not be very frequent, certainly no more often than is required in a refrigerator, which employs the same sort of barrier to keep heat out that is needed by the cooker to keep it in. The germs of putrefaction and decay are destroyed more readily by the high temperature of our cooker than by the ice-cold temperature of our refrigerator.

In either utensil precautions are needed. The plea for economy of heat in cooking will apply equally well to economy of ice in using an ice-cream freezer. In most such freezers no care of this is taken. The low temperature is secured by liquefaction of ice and salt. The heat required for the solution is secured from the surrounding vessels and their contents, which are thereby frozen. There is seldom any care taken to surround the freezer by a nonconductor, and therefore the heat required for melting the ice and and salt is taken quite as much from the surrounding air as from the cream. So more ice is used than needed, and the laborious turning of the freezer is superfluous.

A simple fireless cooker makes a pretty good freezer. First have a vessel sufficient to contain the material to be frozen, then a larger vessel into which the former will sit with a space of one and one-half or two inches between the two, and this space is to be packed with pounded ice and salt. Then put this combination into the proper compartment of a fireless cooker and shut it up. The cream will be frozen in a little longer time perhaps than the revolving freezer requires, but with half the expenditure of ice and salt, and without further care or labor. When so frozen it will keep there all day and longer without melting.